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# ε-expansions in Dyson's hierarchical model

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## Abstract

We consider Dyson's hierarchical model on a d-dimensional hierarchical lattice and define a renormalization group (RG) transformation for complex values of d as a map in the space of sequences of coupling constants determining the model Hamiltonian. We show that d = 4 is a bifurcation value of this transformation for the RG transformation parameter α equal to 1 + 2/d, and we construct a non-Gaussian RG-invariant Hamiltonian in terms of the (4-d)-expansion. We establish that the (α-3/2)- and (4-d)-expansion coefficients for a non-Gaussian fixed point in the dimension d = 3 have the same asymptotic representation as the size of the elementary cell tends to infinity, thus confirming that both the expansions describe the same nontrivial fixed point in the dimension three.

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## Keywords

ε-expansion, Bifurcation, Hierarchical models, p-adic models, Renormalization group